When the Immune System "Misfires": Conceptual Metaphors in Autoimmune Disease Discourse

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ABSTRACT

Metaphorical language dominates the way we communicate about illness (e.g. "*She **won** the **battle** with cancer*" and "*It's the role of the immune system to **fight off foreign invaders**.*"). In this study, I investigate the metaphors commonly used to discuss autoimmune diseases and explore how these metaphors influence treatment intentions and feelings of patient empowerment. This study has two components, a corpus analysis and a series of experiments. I first construct two corpora (one comprised of communication by patients and one comprised of communication by doctors). In line with research on the metaphorical framing of cancer, I find that, by far, the two most common metaphors for autoimmune disease in both corpora are AUTOIMMUNE DISEASE IS A BATTLE and AUTOIMMUNE DISEASE IS A JOURNEY (Semino, E., Demjén, Z., & Demmen, J. 2016. An Integrated Approach to Metaphor and Framing in Cognition, Discourse, and Practice, with an Application to Metaphors for Cancer. *Applied Linguistics*). However, within these broad metaphors, there are several systematic patterns that differentiate the ways patients and doctors discuss the same diseases (e.g. within the metaphor AUTOIMMUNE DISEASE IS A BATTLE, patients tend to fill the role of "attacker" with their disease, while doctors tend to fill it with the immune system). Based on the results of this corpora analysis, I create two experiments to test the consequences of the BATTLE metaphor. Neither experiment had results that were statistically significant. However, I examine the trends revealed in each. The first experiment, built on research by Hauser & Schwarz, shows that when people are exposed to messaging about autoimmune disease that uses BATTLE metaphors (as opposed to neutral messaging), they are more likely to engage in self-limiting behaviors and less likely to engage in self-bolstering behaviors (Hauser, D. J., & Schwarz, N. 2015. The War on Prevention: Bellicose Cancer Metaphors Hurt (Some) Prevention Intentions. *Personality and Social Psychology Bulletin*). The second experiment shows that when the "attacker" is described as the immune system as opposed to a disease, in this case Lupus, people are more likely to take medications that suppress the immune system. The differences in how patients and doctors elaborate JOURNEY and BATTLE metaphors can lead to confusion in communication and should be taken into account for successful healthcare communication.

INTRODUCTION

In this paper, I investigate the conceptual metaphors we use to understand and discuss autoimmune disease. There are many diseases that fall into this category, ranging widely in terms of presentation and severity. The feature they all share is some dysfunction of the immune system, which proves to be difficult to explain without employing metaphorical language. The language I encountered most often on health websites is that the immune system "misfires" and "attacks" other parts of the body. I'm interested in which metaphors are most commonly used, if there's a difference between metaphors used by doctors and patients, and how these metaphors influence people's understanding of, feelings about, and behavior around these diseases.

I build two corpora: one consisting of writing *for* patients (by doctors or other healthcare professionals) and the other consisting of writing *by* patients (in the form of posts and comments on reddit.com/r/autoimmunity). I find that the two most common conceptual metaphors used to understand autoimmune disease in both of these categories are AUTOIMMUNE DISEASE IS A BATTLE and AUTOIMMUNE DISEASE IS A JOURNEY. However, these categories (writing *for* patients and writing *by* patients) tend to differ in how the details of these metaphors are expressed. For instance, even though both groups draw on the concept of a JOURNEY to explain autoimmune disease, doctors almost universally cast the disease as the "traveler" (e.g. "*Current MS disease-modifying treatments don't cure existing symptoms, but they help delay the* ***progression*** *of MS*"), while, for the most part, patients put themselves in the role of the "traveler" ("*[my old doctor] had me on the right treatment* ***path*** *until this new one screwed everything up*"). Similarly, doctors and patients differ in how they fill the "attacker" role when the BATTLE domain is evoked, doctors tending to conceptualize the immune system as the "attacker" ("*These are fascinating and mysterious conditions in which the body's immune system '****misfires****' and* ***attacks*** *its own tissues*"), and patients conceptualizing the "attacker" as the disease itself ("*The thyroid being* ***attacked*** *by Lupus isn't that uncommon apparently*").

Drawing on data examined in these corpora, I develop two experiments designed to test how the metaphorical framings of autoimmunity affect treatment intentions and

feelings of patient empowerment. The first experiment tests the difference between a non-metaphorical explanation of autoimmune disease and an explanation that uses the metaphor AUTOIMMUNE DISEASE IS A BATTLE. The second experiment tests different ways of using the metaphor AUTOIMMUNE DISEASE IS A BATTLE. In one condition, the "attacker" is the immune system, and in the other, the "attacker" is the disease (specifically, Lupus). While none of the results of either experiment were statistically significant, the trends in participant responses indicate that BATTLE metaphors (compared to a non-metaphorical explanation of autoimmune disease) make people more likely to engage in self-limiting behaviors and less likely to engage in self-bolstering behaviors. The second experiment indicates that when the immune system (as opposed to the disease) is in the "attacker" role, people are more likely to take medications designed to suppress the immune system and are no less likely to feel confident about fighting the disease (a finding that runs counter to what I found in the corpus study, in which patients felt more empowered when the disease —as opposed to the immune system — was in the "attacker" role).

BACKGROUND

The main theoretical framework I'm drawing on to structure my analysis is Conceptual Metaphor Theory (CMT), first popularized by George Lakoff and Mark Johnson in their work "Metaphors We Live By" (Lakoff & Johnson, 1981). They argue that metaphors are not just relevant to the domain of creative writing, but, indeed, structure the way we think about virtually everything by creating mappings between abstract and concrete concepts.

They provide examples of everyday language such as "*He **attacked** every **weak point** in my argument*" and "*I've never **won** an argument with him*" in order to claim that we understand the abstract concept of ARGUMENT in terms of the more concrete concept of WAR (Lakoff & Johnson, 1981, p. 5).

In this example, using the language and conventions of CMT, the relationship is expressed as ARGUMENT IS WAR. WAR is what's called the "source domain," which is

the concept that we're drawing from in order to understand the "target domain," (in this case, ARGUMENT). Some of the common mappings from source domain to target domain for this metaphor are illustrated in Figure 1.

Figure 1 (Mappings of Metaphor ARGUMENT IS WAR)

Source Domain (WAR)		**Target Domain (ARGUMENT)**
Fighter	—>	Person arguing
Weapons	—>	Rhetorical strategies
Victory in battle	—>	Winning an argument

However, it's important to note that the mappings between the source domain and the target domain for each metaphor are flexible. Not every usage of the metaphor will explicitly use every mapping (for instance, "*I **fought** hard for my point of view*" doesn't explicitly mention weapons or victory). The mappings can differ (for instance, in the sentence "*Cognitive Behavioral Therapy came onto the scene and **shot down** many of the previous arguments for traditional talk therapy*," the fighter is mapped onto an idea, in this case a school of therapy, as opposed to a person). New mappings can always be created (for instance, "*I become **Sweden** whenever my roommates are arguing and either of them asks me to take their side in the **fight***" creates the mapping: neutral country —> person not engaging in an argument). And, of course, the same source domain isn't always used to understand a particular target domain (for instance, "*When I try to argue with him, I feel **lost** in a **thick fog**, and I can't **find** my **way** to **where** I was **going***" uses the metaphor ARGUMENT IS A JOURNEY, with its own set of mappings).

Importantly, Lakoff and Johnson claim that metaphors don't just influence how we talk about these concepts, but how we think about and engage with them. For instance, they assert that it is due to this very common conceptual mapping between ARGUMENTS and WAR that we often think of those we are arguing with as opponents and even that we conceive of winning or losing arguments at all. They offer a hypothetical society in which the concept of ARGUMENT is commonly mapped not to WAR but to DANCE. Presumably, those in this society would carry out arguments in

more balanced and graceful ways, and there would be no concept of winning or losing an argument.

This is part of what makes CMT so exciting as a research framework. Exploring the way we talk about particular concepts can help illuminate the intricacies of how we understand and engage with these concepts. It reveals how things that might feel like fundamental aspects of reality (e.g. that an argument has a winner and a loser) are actually constructed based on the way we've mapped one concept to another, and, therefore, there are different ways of understanding these concepts.

Illness is especially interesting (and, I would argue, important) to study through the lens of CMT. If we understand particular diseases through particular source domains, presumably this shapes how we think about treatment, research, patient responsibility, and much more.

"Autoimmune disease" is a fairly general term that includes many diseases with seemingly unrelated symptoms such as Multiple Sclerosis, Lupus, Rheumatoid Arthritis, and Celiac Disease (among many others). The thing that links them all, as countless medical websites will tell you (with slight permutations), is that these are conditions in which your immune system "mistakenly attacks" some part(s) of your body. A definition which seems ripe for CMT analysis.

Many researchers have investigated the role metaphor plays in how we understand illness (Gwyn, 1999; Hodgkin, 1985; Mabeck, 1997; Sontag, 2002). Often, these investigations take the form of intuitions by doctors or scholars or, when done more systematically, ethnographic interviews from which metaphorical language is pulled. Very frequently, the object of investigation is cancer (Bowker, 1996; Gibbs & Franks, 2002; Reisfield & Wilson, 2004; Semino, et al., 2015; Skott, 2002). Semino, Demjén, and Demmen (2016) studied a corpus of online forum posts by cancer patients that consisted of 500,134 words. They found that 1.8 words per every 1,000 were BATTLE-related metaphors for the experience of cancer, and 1.46 words per 1,000 were JOURNEY-related metaphors (Semino, Demjén, & Demmen, 2016, p. 633). These were the two most common metaphors for cancer they encountered in their corpus. Clearly, patients are relying on the source domains of BATTLES and JOURNEYS to

communicate their experiences with cancer.[1] What is less clear, though, is whether these metaphors are helpful or harmful for those with a cancer diagnosis. The authors don't provide a universal answer, instead arguing that there are several scenarios subordinate to each main metaphor they find, and that these scenarios can be applied to various aspects of a patient's experience. For example, one patient may use a metaphor that focuses on preparing for battle, while another uses one that focuses on the outcome of a battle. In some cases the "opponent" in the BATTLE domain gets mapped to cancer itself, and in others it's mapped to one's doctor (for instance, if a patient has to fight for information or a certain treatment). Some of the different mappings of "opponent" they found within the metaphor CANCER IS A BATTLE are illustrated in Figure 2. The authors conclude that, in general, some scenarios foster patient empowerment while others foster patient disempowerment, but they do not claim that this is universal for any scenario nor do they claim that these metaphors for cancer (BATTLE metaphors and JOURNEY metaphors) are ultimately good or bad.

Figure 2 (Mappings in Semino, Demjén, & Demmen [2016], examples from p. 637)

Different mappings of "Opponent"			**Examples**
Battle	→	**Cancer**	
Opponent	→	Cancer	"I'm ... also sharpening my weapons in case I have to do battle"
Opponent	→	Emotional toll of cancer	"But the emotional side of cancer and of BC in particular is the real killer—it strangles and shocks your soul"
Opponent	→	Cancer treatment	"what did i think all my normal little cells were doing after being hit by a sledgehammer of both toxic chemicals and radiation"
Opponent	→	Doctor	"We won that battle but imagine what would have happened if she hadn't had a family to defend her?"

Downing and Mujic (2009) identified some of the same conceptual metaphors when investigating Scientific American abstracts for papers dealing with immunology.

[1] Semino, Demjén, & Demmen use the term "VIOLENT CONFRONTATION" to describe the source domain. I'm using the term "BATTLE" to make it clear that there is consistency between the metaphors they found for cancer and those that I found for autoimmune disease.

They split their findings into ontological, structural, and orientational metaphors. They did not focus on a particular target domain; the four most common domains they identified were the human body, illness/disease, the immune system, and external microorganisms.[2] I am most interested in the structural metaphors they found, the source domains of which they label JOURNEY and WAR.[3] It seems that these are common metaphors when discussing illness. Most of their examples focus on infectious disease, in which the infectious bacteria or virus is construed as the "enemy" in the WAR frame. For example: "*In response to HIV infection, the body* ***deploys troops of combatants*** *known as CD4+ T cells to carry out a* ***counter attack*** (Downing and Mujic, 2009, p. 77). They do, however, assert one metaphor related to autoimmune disease: AUTOIMMUNE DISEASE IS FRIENDLY FIRE, which is compatible with the data I found.

Several experimental studies have shown that relatively abstract concepts (such as electricity, emotional warmth, and power) are understood metaphorically through more concrete source domains (Gentner, 1983; Schubert, 2005; Williams & Bargh, 2008). Often, there is more than one source domain commonly used to understand a particular target domain, and selecting one rather than another can frame the target domain much differently, which can (often subconsciously) influence perception and behavior. For instance, Thibodeau and Boroditsky (2011) conducted experiments in which they investigated how the metaphorical framing of crime (either as a wild beast or as a virus) influences the decisions people make about the best way to deal with crime and the type of information they deem relevant to make these decisions. They find that subtle shifts in framing crime (even as small as changing a single word) can significantly affect the way people attempt to solve the problem of crime. Framing crime as a beast makes people more likely to suggest strategies of enforcement like increasing police activity and instituting harsher prison sentences, similar to the way one would want to capture a wild beast running wild in a city and cage it or kill it. Framing

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[2] Although Downing and Mujic label these as four distinct target domains, another interpretation is that ILLNESS/DISEASE is the target domain and the body, the immune system, and external microorganisms are all constituents of this domain.

[3] Again, they way they use WAR is synonymous with the way I use BATTLE

crime as a virus makes people more likely to suggest strategies of reform such as increased education in an attempt to get to the root of the problem, similar to the way one would want to figure out the origin of a viral infection and inform people how to best avoid it. Amazingly, these different metaphorical representations of crime had a greater impact on how participants suggested crime should be dealt with than the political party affiliation of the participant (democrat or republican) even though these political parties tend to suggest dealing with crime in significantly different ways. Also interesting is that when participants were asked what informed their decisions about how to deal with crime, almost all of them pointed to statistics provided in the experimental stimuli (statistics that were identical across the different metaphorical framings). Almost no one pointed to the metaphorical language as the source of their decision, meaning that metaphorical framing is important yet covert.

Likewise, it is important to keep in mind that the metaphors we use to understand and communicate illness have real world consequences. This is evidenced nicely in experiments performed by Hauser and Schwarz (2015). They investigated whether conceptual metaphors that describe cancer as an enemy influence people's reasoning about cancer and their willingness to engage in a variety of preventive behaviors. In their first study, the found that when framing cancer as an enemy, self-limiting prevention behaviors came to mind much less frequently, but self-bolstering prevention behaviors did not come to mind significantly more frequently. In their second and third studies, they found that framing cancer as an enemy lowered intentions for self-limiting behaviors compared to a neutral representation of cancer, but did not increase intention for self-bolstering behaviors. Thus, they concluded that the WAR frame, when applied to cancer, was actually harmful as it made people less likely to engage in things like healthy diets, while also not increasing the likelihood that they would engage in exercise or other self-bolstering behaviors. These results and examples are illustrated in Figure 3.

Clearly, metaphorical framings influence the way we understand all kinds of concepts and even have an impact on real-world behavior. Several studies also reveal that the impact of these framings is covert; people are rarely aware that they're being influenced by them, and yet they are. Therefore, studying which metaphors are used to

understand autoimmune disease is fundamental to making effective suggestions for how best to frame these diseases in healthcare communication.

Figure 3 (Summary & Examples of Hauser and Schwarz's [2015] Findings)

Cancer Framed as an Enemy (Compared to Neutral Description of Cancer)	
Self-limiting prevention/monitoring behaviors ↓	Self-bolstering prevention/monitoring behaviors —
Examples of self-limiting behaviors: limiting alcohol, red meat, and high-fat food	Examples of self-bolstering behaviors: eating fruits, vegetables, and high fiber foods

CORPUS STUDY

METHODOLOGY

I compiled balanced corpora for communication by patients and communication by doctors. I began with the patient corpus, collecting posts and comments from the Autoimmunity subreddit (subreddits are sections of reddit.com dedicated to specific interests or communities; the Autoimmunity subreddit is described as "A subreddit to provide support for those diagnosed with [or are relatives/friends of those diagnosed with] an autoimmune or autoinflammatory disease.") I chose this subreddit, as opposed to one dedicated to a specific autoimmune disease like Lupus, because I am interested in how patients discuss autoimmunity regardless of the manifestation. I ordered the posts from most recent to least recent (Reddit has several ways of ordering posts, such as by popularity, how controversial a post is, etc) and collected data until I reached 20,000 words. This number is significantly smaller than the corpora of some similar studies. For instance, Semino, et al. (2015) looked at two corpora, together totaling 753,302 words. I chose 20,000 because I wanted a corpus big enough that the patterns I encountered would be meaningful, but small enough that I could read through the corpus in its entirety and identify metaphorical language.

Next, I collected data for the doctor corpus. This was slightly less systematic. Instead of a single website, I found a number of websites, blogs, and podcast transcripts in which doctors discuss autoimmune diseases. I only included sources where it was clear that patients were the intended audience as I am interested in how

autoimmune disease is communicated by doctors to patients, rather than, for instance, how doctors talk about autoimmunity amongst each other. Therefore, I did not look at things like scientific papers. Again, I capped this corpus at 20,000 words.

I then read through each corpus, identifying metaphorical language using the Metaphor Identification Procedure (MIP) proposed by the Pragglejaz Group (2007). The MIP first requires you to read through the text in order to get a general understanding of the meaning. In my case, this meant reading through the entirety of each forum post or comment (in the case of the patient corpus) and each interview, podcast transcript, blog post, etc (in the case of the doctor corpus). Then, in order to decide if each lexical unit was being used metaphorically, I determined if it had a more basic meaning than the one being used in it's current context. According to the MIP, a "basic" meaning is one that is more concrete, related to bodily action, more precise, and/or historically older (Pragglejaz Group, 2007, p. 3). The more basic meaning is not necessarily the meaning that is currently the most widely used. For instance, in the sentence "I struggle daily living with chronic illnesses," I marked "struggle" as metaphorical because the meaning of "struggle" associated with using your physical strength against someone or something is both historically older and more related to bodily action than the meaning of "struggle" as an emotional effort (the way it's used in the context of the sentence), even though today it may be more common to talk about an emotional struggle than a physical one.

Once I identified all the metaphorical language in both corpora, I sorted the metaphors by source domain and calculated frequencies for each source domain in each corpus. This was done by counting all the words that evoked JOURNEY metaphors, BATTLE metaphors, MYSTERY metaphors, MACHINE metaphors, etc, and dividing these numbers by the total number of words in each corpus.

Next, based on patterns I noticed in the patient corpus, I did targeted keyword searches in the Autoimmunity subreddit (for keywords "fight," "attack," "battle," "war," "journey," "reach," "destination," and "goal"). These searches were motivated by the desire to have a more robust set of metaphorical language in order to find patterns for the 'Empowerment vs Disempowerment' section of this paper. The data I gathered from these targeted searches were not included in the sections of this paper dedicated to

analyzing the patient and doctor corpora because they would have influenced the frequency statistics and patterns. In these targeted searches, I found some examples of constituent mappings that run counter to the patterns I found in the corpora. These examples are interesting but do not necessarily negate the patterns found in my corpora. The corpora are balanced snapshots of communication from which to make general conclusions about patterns, but they are not intended to capture every single way someone might explain autoimmunity.

RESULTS & DISCUSSION

Based on my frequency counts, JOURNEYS and BATTLES are the two most common domains drawn on to understand and explain autoimmune disease in both the patient corpus and the doctor corpus. There were, of course, other domains used by both patients and doctors, such as the domain of machines (e.g "*Autoimmune diseases stem from a **glitch** in the immune system*") and the domain of cleanliness (e.g. "*We did follow-up tests more recently and I'm still all **clean** except for the usual positive inflammation markers for my mixed connective tissue disease*"). However, in both the doctor and the patient corpora, JOURNEY and BATTLE domains were drawn on far more often than any others, and will therefore be the focus of this analysis since patterns found in other domains are too infrequent to be meaningful.

The fact that these two domains are so common in discussing autoimmunity is unsurprising as these seem to be common metaphors used to understand all kinds of illness. We speak of "***fighting** off the flu*" and "***navigating** cancer.*" However, it is important to consider which constituents of the JOURNEY and BATTLE domains are evoked to explain which components of autoimmunity, as well as how these mappings differ between patients and doctors.

Quantitative Findings

AUTOIMMUNE DISEASE IS A JOURNEY:

Patient Corpus: 4.4 words per 1,000
Doctor Corpus: 1.8 words per 1,000

AUTOIMMUNE DISEASE IS A BATTLE:

Patient Corpus: 1.1 words per 1,000
Doctor Corpus: 4.3 words per 1,000

Patterns of Discrepancy Between Patient Corpus and Doctor Corpus

AUTOIMMUNE DISEASE IS A JOURNEY

The common mappings for the JOURNEY domain by patients and doctors are illustrated in Figure 4. The most glaring distinction between the patient corpus and the doctor corpus is which element from the AUTOIMMUNITY (target) domain takes the role of the "traveler" from the JOURNEY (source) domain. In the patient corpus, the role is usually filled by the patient themselves (e.g. "*I am switching things up with my treatment plan and am **regressing** a bit*"), while in the doctor corpus, it is overwhelmingly filled by the autoimmune disease (e.g. "*we have **stopped** the **progression** of their disease and **halted** the disease with these agents*").[4] This is potentially problematic as "progress" refers to opposite phenomena. For doctors, "progress" is negative as it means the disease is getting worse, but for patients, "progress" is a good thing, implying moving closer to a diagnosis, remission, or just generally better health.

This inversion affects many of the other constituents of the metaphor as well. For instance, an "obstacle" along the "journey" in the doctor corpus is typically the doctors themselves or the drugs used to treat the autoimmune disease (e.g. "*If we're correct, we might **stop** autoimmune diseases in these patients using DYRK1A inhibitors that are in development.*") while, in the patient corpus, the "obstacle" is usually an

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[4] I want to acknowledge that this example, as well as many others in the doctor corpus, may actually be drawing from the BATTLE domain as well as drawing from the JOURNEY domain (it's easy to imagine that the example above is comparing the disease to an oncoming attacker rather than a traveler). I chose to label such cases as JOURNEY metaphors rather than BATTLE metaphors for two reasons. Firstly, because several examples reference a "source" or beginning, which is common in JOURNEY metaphors but less so in BATTLE metaphors (e.g "*It's good to go to your physician having it [the history of your symptoms] fresh in your mind, what it is and when things **started** and how it **progressed**.*" Secondly, even if these examples are drawing on one's understanding of BATTLE, they're also relying on one's understanding of movement and JOURNEYS (at least basic ideas of starting a journey and making progress along the way); sometimes the borders between domains in Conceptual Metaphor Theory are somewhat porous.

unhelpful provider or unsuccessful treatment (e.g. "*I'm sorry you've been **through** so many meds*").

The "milestone/landmark" constituent of the JOURNEY domain is an interesting case because, when evoked, it tends to be one of the rare cases where doctors pattern with patients and map the "traveler" onto the patient. However, like the more common cases from the doctor corpus, in which "progress" is a negative thing as it implies a worsened disease state, here too a patient's "progress" is a "journey" into worse health (e.g. "*The average person with MS, if left untreated, will reach a **stage** called **progressive** MS, which is characterized by a slow, **progressive** decline in walking function*"). It's easy to imagine the example above being written along the lines of "*MS **progresses** in distinct stages, one of which is characterized by a decline in walking function*," which would cast MS as the "traveler" and fall in line with the way the JOURNEY metaphor is almost universally elaborated in the doctor corpus. Interestingly, though, whenever a "milestone" or "stage" of the JOURNEY is mentioned in the doctor corpus, the patient becomes the "traveler." While there may be several reasons why this is the case, what seems most important to note is that even when the constituents of the source domain are filled in with different elements of the target domain, the general trend of "progress" being viewed negatively in the doctor corpus remains.

When a "milestone" or "landmark" is evoked in the patient corpus, it's almost always to mark a point in time when the patient had worse symptoms or a different diagnosis than they do at the time of writing (e.g "*I felt betrayed by my body **at one point**. Now I just want to feel better.*" and "*I was thought to have Lyme **at one point**, bc no one could figure it out.*") While feelings of frustration are common when "landmarks" are evoked in the patient corpus, "progress" on the "journey" is still typically positive "progress" toward a correct diagnosis, symptom relief, or something similar, which differentiates the instances of this metaphor from those in the doctor corpus, in which "progress" is a bad thing.

The fact that "progress" is almost universally positive in the patient corpus and negative in the doctor corpus is a potential source of confusion in doctor-patient communication. One can imagine a case in which, during an appointment, a doctor might say something along the lines of "We've progressed to the point where a new medication is indicated," meaning, for the doctor, that the disease has gotten worse, but,

because of the strong framing of “progress” as positive in the patient corpus, the patient might be under the impression that his or her disease has gotten better. This is simply one hypothetical example that would most likely be clarified with more context, but this substantial difference in how “progress” is viewed needs to be taken into account when designing medical informational materials for patients.

Figure 4 (Mappings for AUTOIMMUNE DISEASE IS A JOURNEY)

Mappings common in the *patient* corpus		**Mappings common in the *doctor* corpus**	
Journey →	**Autoimmune Disease**	**Journey** →	**Autoimmune Disease**
Traveler →	Patient	Traveler →	Disease
Obstacle →	Unhelpful Provider/treatment	Obstacle →	Successful provider/treatment
Landmark →	Worse symptoms/different diagnosis	Landmark →	Point where symptoms will worsen
Progress →	Move toward better health	Progress →	Worsening of symptoms

AUTOIMMUNE DISEASE IS A BATTLE

The common mappings for the BATTLE domain by patients and doctors are illustrated in Figure 5. The ways that patients and doctors use BATTLE metaphors are not quite so antithetical to each other as the ways in which they use JOURNEY metaphors. However, there are still discrepancies between the corpora that reveal differences in thinking between doctors and patients. Most notably, the patient as a whole person is absent from any conceptualizations of this metaphor in the doctor corpus. The most common constituent mapping of the BATTLE metaphor in the doctor corpus is to map the “attacker” onto the immune system and the “attacked” onto the body part affected (e.g “*Multiple sclerosis (MS) is a condition where the immune system* ***mistakenly targets*** *the central nervous system*”).

In contrast, patients tend to conceptualize the disease as the “attacker” and themselves as the ones “fighting” the disease (e.g. “*Lupus is simply my newest* ***opponent****.*”) Patients seem to have much more agency in the BATTLE metaphors found in the patient corpus than those found in the doctor corpus because they are frequently an active participant in the “fight” against their disease.

In the doctor corpus, the immune system “attacks” a part of the body, which typically just receives the attack, defenseless. Presumably, drugs and other treatments

could fill the role of a "defender" in this framework, but I did not encounter any examples of this in the doctor corpus. It makes sense that in the typical doctor's conceptualization there would be no "defender" as, usually, the immune system is thought of as the "defender" of the body when BATTLE metaphors are evoked in situations that don't involve autoimmune disease. This mapping is commonly found in the doctor corpus when discussing how the body typically operates (e.g "*Your immune system is your **defense** against **invaders**. It is your internal **army***"). I believe this is why extensions to the metaphorical mapping are so common when using a BATTLE frame to explain autoimmunity. If your immune system is your "army," protecting you from outside forces, something must have gone wrong if it begins "attacking" parts of yourself. Hence, the conceptualization of the immune system as a "mistaken" or "confused" attacker, one that "accidentally fires" on members of its own team (e.g "*Autoimmunity occurs when your immune system gets **confused** and your own tissues get caught in **friendly cross-fire**.*"). In rare cases, this is conceived as a conscious choice rather than a mistake (e.g. "*They [autoimmune diseases] occur when a person's immune system **decides** to **attack** healthy body cells*"). In both cases (the immune system as a "mistaken attacker" and as an "intentional attacker"), the immune system is being personified as someone doing harm to it's host. While there is sometimes some level of personification when the disease is the "attacker," this rarely reaches the level of the disease making "mistakes" or "decisions"

Healthcare providers should be aware that BATTLE metaphors in which the immune system is the "attacker" are less empowering for patients than those in which the disease is the "attacker." One explanation for why this is the case is that a disease is more abstracted and externalized than a part of one's own body, and it's easier to conceive of winning a battle against a disease than against one's own immune system. That's not to say that the immune system should never be referred to as the "attacker" (in some cases it might encourage patients to take certain kinds of medications, as discussed later in this paper), just that the prevalence of this mapping should be examined through the lens of the experience of patients.

Figure 5 (Mappings for AUTOIMMUNE DISEASE IS A BATTLE)

Mappings common in the *patient* corpus			**Mappings common in the *doctor* corpus**		
Battle	→	**Autoimmune Disease**	**Battle**	→	**Autoimmune Disease**
Attacker	→	Disease	(Mistaken) Attacker	→	Immune system
(Active) Defender	→	Patient/body	Attacked	→	Body/body part

Empowerment Versus Disempowerment

When analyzing the implications of these metaphorical models, an important consideration is how empowered they frame the patient as. This has been a key factor in metaphor research of cancer discourse. Semino et al. (2015), working with cancer discourse, define empowerment and disempowerment as "an increase or decrease in the degree of agency that the patient has, or perceives him/herself to have...[which] involves the (perceived) ability to control or react to events for one's own benefit, where this ability is desired by the patient and not externally imposed" (Semino et al., 2015, p. 62). They conclude that conceptual metaphors themselves (such as CANCER IS A BATTLE or CANCER IS A JOURNEY) are not inherently empowering or disempowering, rather, one needs to look at each individual example. For instance, cancer can be described as "*attacking from the inside*," which Semino et al. label as disempowering, while someone else can say they are "*ready to kick some cancer butt*," which the authors label as empowering, but both of these examples fall under the conceptual metaphor, CANCER IS A BATTLE (Semino et al., 2015, p. 62-63).

While broad conceptual metaphors such as AUTOIMMUNE DISEASE IS A BATTLE or AUTOIMMUNE DISEASE IS A JOURNEY (just like their cancer counterparts) are not inherently empowering or disempowering, asserting that one needs to look at each linguistic instantiation is not very satisfying as it doesn't leave researchers with much advice to give healthcare practitioners about how to structure the metaphors in their messaging. Semino et al. do look at particular scenarios within these larger metaphors, which they label as empowering (such as "Patient successfully fighting the disease" or "Patient as a traveller in charge of the journey") or disempowering (such as "Patient unsuccessfully fighting the disease" or "Patient as a traveller on a difficult journey") (Semino et al., 2015, p. 63). However, they do not necessarily engage in analysis of the constituent mappings of the larger conceptual metaphors. Although, I should note that two of the empowering scenarios they find ("Mutual encouragement and solidarity" in the BATTLE domain & "Patients as traveling companions" in the JOURNEY domain) do line up pretty much exactly with two of the empowering constituent mappings I find (*Travel companions —> Fellow patients* & *Fellow fighters —> Fellow patients*).

As it turns out, at least when it comes to autoimmune disease, certain mappings pattern more with either empowered or disempowered sentiment, as does the inclusion of certain constituents. These mappings can serve as a reference for healthcare providers as to what kind of messaging will make patients feel more optimistic and in control of their situations and what kind of messaging has the potential to make patients feel disempowered about their diseases.

Of course, there are also several mappings that aren't correlated with empowerment or disempowerment, either because they are evoked roughly equally with empowered and disempowered sentiments or because they are evoked with neutral sentiment. For instance, within the AUTOIMMUNE DISEASE IS A JOURNEY metaphor, examples mapping the destination of the JOURNEY to getting a diagnosis don't appear to pattern with empowerment or disempowerment; some are empowering, some disempowering, and most neutral.

Below are the mappings I found that pattern with patient empowerment or disempowerment.

AUTOIMMUNE DISEASE IS A JOURNEY

Constituent mappings that generally pattern with empowerment:

Traveler —> Patient
Travel companions —> Fellow patients
Examples:
1) *"Just wanted to let you know you aren't **alone** in this part of the **journey"***
2) *"I have lupus but one of my best friends has RA and we **keep each other going** in the gym"*

Staying on path —> Symptoms/life in a state of stability
Examples:
1) *"The Gabapentin has absolutely helped my mental health get **back on track**"*
2) *"If anyone could please share some threads or websites that would help me get **on track** as to what to eat or what to avoid it'd be greatly appreciated."*

Constituent mappings that generally pattern with disempowerment:

Obstacles on the journey → Unhelpful providers or treatments
Examples:
1) *"Aw, I'm sorry you've been **through** so many meds"*
*2) "So far it's only been suggested by a few doctors, none have taken charge over the situation so far to actually **move forward to** a solid diagnosis"*

AUTOIMMUNE DISEASE IS A BATTLE

Constituent mappings that generally pattern with empowerment:

Fighter → Patient
Fellow fighters → Fellow patients
Examples:
1)*"The sense of community in this sub has brought me so much hope and I hope we can all **fight** through it together."*
2) *"We can definitely **fight** it together, or mourn it together."*
3) *"Just how (sic) that you have a huge community of people who are **fighting** in the trenches with you"*

Constituent mappings that generally pattern with disempowerment:

Attacker → Body
Attacked → Body part

Examples:
1) *"I'm a 21 year old female, and I was diagnosed with posterior uveitis (autoimmune disease that makes my body **attack** my retinas)"*
2) *"It means that my body **attacks** my red blood cells and destroys them."*
3) *"It basically means that my body **attacks** my cartillage (sic)"*

Attacker → Immune system
Attacked → Body part

Examples:

1) *"whenever our body tries to form these healthy cells our immune system goes in **attack** mode again"*

2) *"I'm worried that her immune system is **attacking** her CNS"*

EXPERIMENTAL STUDIES

INTRODUCTION & BACKGROUND

After analyzing the corpus data, I drew on distinctions between the doctor corpus and the patient corpus in order to create experiments designed to test how metaphorical representations of autoimmune disease affect treatment intentions and feelings of empowerment.

I chose to focus only on the BATTLE domain. Though the differences in how patients and doctors employ JOURNEY metaphors are interesting, several components made systematically testing the effect of these differences difficult. For instance, the corpus data revealed that doctors and patients use the idea of "progress" along a journey to express opposite situations (for doctors, it is usually the disease progressing, while for patients, they themselves are the ones making "progress"). The fact that these clearly express different circumstances make testing these two scenarios relatively pointless; asking participants to rate how empowered or optimistic they might feel if they themselves made "progress" versus if their disease made "progress" would be unlikely to produce any interesting data because the former is obviously a better scenario for the participant. In addition, these metaphors are almost always housed within a context that does even more to reveal the opposite versions of progress: "*MS can **progress to the point** where one's eyesight becomes affected*" versus "*I've **progressed to the point** where I've been able to stop one of my medications.*"

I created two experiments.[5] Experiment 1 tests the difference between a non-metaphorical description of autoimmune disease and a description that uses BATTLE metaphors on influencing intentions to engage in behaviors that have been found helpful in easing the symptoms of some autoimmune diseases. This study is directly inspired by the work of Hauser & Schwarz (2015), who found that using BATTLE metaphors in cancer messaging, compared to a non-metaphorical control, decreased participants' intentions to engage in self-limiting prevention behaviors, while not increasing their intentions to engage in self-bolstering prevention behaviors.[6] Therefore, the authors conclude that BATTLE metaphors in cancer messaging are potentially harmful to public health.

Based on their findings, it would be logical to expect the same results: that BATTLE metaphors in a description of autoimmune disease will lower the intention to engage in self-limiting behaviors, while not increasing the intention to engage in self-bolstering behaviors. However, the common messaging around autoimmune disease (as reproduced in my experiment) is different from cancer messaging in that it's made explicit that the immune system, the part of the body that usually "protects" you from "outside invaders," is now "mistakenly attacking" healthy parts of the body. While cancer is still obviously housed inside (or on the surface of) the body, it's rarely conceived of as "part of you" in messaging. My intuition is that because individuals clearly do not want to "destroy" their immune systems in the same way that they would like to "destroy" cancer, when the immune system is framed as the "attacker" using BATTLE metaphors, people may actually be less likely to engage in both self-limiting and self-bolstering behaviors compared to the non-metaphorical control; less likely to engage in self-limiting behaviors because the BATTLE frame is still being activated, and less likely to engage in self-bolstering behaviors because the immune system is not an "opponent" people are quick to want to harm.

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[5] To reference either experiment, please see appendix 1, where they are reproduced in full. Due to the nature of Qualtrics, the experiments had to be combined into one, and participants were randomly sorted into each condition within each experiment.

[6] Hauser & Schwarz use the term "ENEMY," but I'm using "BATTLE" for the sake of consistency as there is no practical difference between their "ENEMY" framing and my "BATTLE" framing.

Experiment 2 compares two versions of the metaphor AUTOIMMUNE DISEASE IS A BATTLE, one in which the disease fills the "attacker" role (more common in writing by patients) and one in which the immune system fills the "attacker" role (more common in writing by doctors), and tests whether these different framings influence feelings of empowerment and treatment intentions. My hypothesis is that the description in which the disease fills the "attacker" role will lead to greater feelings of empowerment because it is more externalized than the immune system; it seems easier to conceive of "winning a battle" against a disease than "winning a battle" against one's own immune system. This hypothesis is based on findings from the corpus study.

In terms of treatment intentions, this experiment asks how likely participants would be to take the three most common types of medication prescribed for autoimmune diseases (medications to relieve symptoms, medications to replace vital substances the body can no longer make on its own, and medications to suppress the immune system). I expect the biggest difference between the conditions to be that participants who read the description in which the immune system fills the "attacker" role will be more likely to take medications to suppress the immune system.[7] I expect intentions to take the other two kinds of medication to remain even across the two groups.

EXPERIMENT 1

Materials and Procedure

Experiment 1 compares a non-metaphorical explanation of autoimmune disease to an explanation that uses metaphorical language drawn from the BATTLE domain. The explanation using a BATTLE framing is taken unaltered from medlineplus.gov, a

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[7] Arguably, this hypothesis contradicts my hypothesis for experiment 1 (i.e. that participants will be less likely to engage in self-bolstering behaviors when BATTLE metaphors are used to describe autoimmune disease because they are hesitant to "attack" or "destroy" their immune systems). In response, I would say that the language used in experiment 2 ("suppress") does not necessarily imply damage to the immune system. However, it does also seem possible that the results of experiment 1 will be more in line with my hypothesis for experiment 2 (i.e. autoimmune disease described with BATTLE metaphors will make participants more likely to engage in self-bolstering behavior because they see the immune system as an enemy to fight).

site put out by the National Institutes of Health. In order to create the non-metaphorical representation, I altered every word or phrase that evoked the BATTLE domain in the original to a non-metaphorical - or at least less-metaphorical - "translation" (for instance, "*If you have an autoimmune disease, your immune system **attacks** healthy cells in your body*" became "*If you have an autoimmune disease, your immune system **can negatively affect** healthy cells in your body*").

Participants were presented with one of the two explanations of autoimmune disease (non-metaphorical or BATTLE frame) and asked to read it before being presented with four different behaviors found to be helpful in alleviating the symptoms of some autoimmune diseases and asked how likely they were to engage in each behavior, with a choice of six options ranging from 1 (extremely unlikely) to 6 (extremely likely).[8] Two behaviors are classified as self-bolstering (being physically active for 30 minutes a day & eating more fruits, vegetables, and/or lean meats) and two behaviors are classified as self-limiting (limiting sun exposure & limiting consumption of caffeine, alcohol and sugar).

Participants

50 participants (35 male, 14 female, and 1 choosing not to disclose) ranging from age 24-83, with the average age being 40.3. They were recruited from the Amazon Mechanical Turk platform and were redirected to the experiment hosted on Qualtrics. They were compensated for their participation.

Results and Discussion

In order to calculate the statistical significance I used a one-tailed t-test assuming equal variances. I chose an alpha of 0.05, which is standard in statistical analysis.

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[8] These behaviors were gathered from a variety of sources (healthline.com, womenshealth.gov, mindbodygreen.com, etc.) with some seemingly more robustly backed by science than others. However, the total efficacy of these behaviors is not crucial to the experiment. Instead, it is important to have behaviors that could be classified as "self-limiting" or "self-bolstering."

The 24 participants exposed to the neutral description of autoimmune disease (M = 4.23, SD = 1.06) compared to the 26 participants exposed to the description that used BATTLE metaphors (M = 4.52, SD = 1.17) were (non-significantly) less likely to indicate that they would engage in self-limiting behaviors, t(48) = -0.91, p = 0.182.

The 24 participants exposed to the neutral description of autoimmune disease (M = 5.08, SD = 0.92) compared to the 26 participants exposed to the description that used BATTLE metaphors (M = 4.98, SD = 0.95) were (non-significantly) more likely to indicate that they would engage in self-bolstering behaviors, t(48) = 0.38, p = 0.350.

The average response for the likelihood of engaging in the self-bolstering behaviors was 4.98 for those in the BATTLE condition (between “slightly likely” and “moderately likely”), while for those in the neutral condition it was 5.08 (between “moderately likely” and “extremely likely”). The average response for the likelihood of engaging in the self-limiting behaviors was 4.52 for those in the BATTLE condition (between “slightly likely” and “moderately likely”), while for those in the neutral condition, it was 4.23 (also between “slightly likely” and “moderately likely”).

If we disregard statistical significance for a moment, it seems as though BATTLE metaphors make people slightly less likely to engage in self-bolstering behaviors but slightly more likely to engage in self-limiting behaviors when it comes to easing the symptoms of autoimmune disease. This is contradictory to the results of Hauser & Schwarz (2015), who found that framing cancer as an “enemy” to be “battled” (compared to a non-metaphorical framing) decreased intentions for self-limiting behaviors and did not change intentions for self-bolstering behaviors. It could be that my hypothesis about people’s reactions to viewing the immune system as an “opponent” is partially correct. Perhaps people are disinclined to mount an “attack” on a crucial part of their body (a scenario evoked by the BATTLE frame but not by the neutral frame), even if this part of their body is doing them harm, and they are therefore less likely to engage in behaviors that would make them more “powerful” against their immune systems, instead opting for behaviors that might ease symptoms but not increase their capacity to “fight” their immune systems.

However, the p-values for both of these conditions are much higher than the alpha, so it's important to note that the variations seen in this study could very well fall within the realm of natural chance.

EXPERIMENT 2

Materials and Procedure

Experiment 2 tests the difference between filling the "attacker" role with the disease (common in writing by patients) and filling it with the immune system (common in writing by doctors). I test how this difference affects feelings of empowerment and treatment intentions when faced with a hypothetical diagnosis of Lupus (a common autoimmune disease). The difference between these two conditions was small, a slight wording distinction in the description of Lupus:

Attacker —> Disease: "Imagine you have been diagnosed with Lupus (an autoimmune disease that can attack your joints, skin, kidneys, blood cells, brain, heart, or lungs)."

Attacker —> Immune system: "Imagine you have been diagnosed with Lupus (an autoimmune disease *in which your immune system can mistakenly* attack your joints, skin, kidneys, blood cells, brain, heart, or lungs)."

Participants were presented with one of these two descriptions and then asked a series of questions. First, they were asked, "How much do you agree with the following statement: 'I'm confident that I can fight this disease and have a good quality of life." They chose from a six-item scale, ranging from 1 ("strongly disagree") to 6 ("strongly agree"). The following page presented the text: "The types of medication on the following pages have been found to be useful in managing Lupus. How likely are you to take each type if it was suggested by your doctor?" which was followed by medications to relieve symptoms, medications to replace vital substances the body can no longer make on its own, and medications to suppress the immune system, where participants

chose how likely they were to take each type of medication on a six-item scale from 1 (“extremely unlikely”) to 6 (“extremely likely”).

Participants

51 participants (28 males and 23 females) ranging from age 19-74, with the average age being 39.8. They were recruited from the Amazon Mechanical Turk platform and were redirected to the experiment hosted on Qualtrics. They were compensated for their participation.

Results and Discussion

As in study 1, I used a one-tailed t-test assuming equal variances and used an alpha of 0.05, which is standard in statistical analysis.

When faced with a hypothetical Lupus diagnosis, the 26 participants who read the description of Lupus in which the disease filled the “attacker” role ($M = 3.69$, $SD = 1.49$), compared to the 25 participants who read the description in which the immune system filled the “attacker” role ($M = 3.68$, $SD = 1.41$), were no more or less likely to agree with the statement “I’m confident I can fight this disease and have a good quality of life,” $t(49) = 0.030$, $p = 0.488$.

When faced with a hypothetical Lupus diagnosis, the 26 participants who read the description of Lupus in which the disease filled the “attacker” role ($M = 3.65$, $SD = 1.41$), compared to the 25 participants who read the description in which the immune system filled the “attacker” role ($M = 4.16$, $SD = 1.25$), were (non-significantly) less likely to indicate that they would be willing to take medications to suppress the immune system, $t(49) = -1.354$, $p = 0.091$.

When faced with a hypothetical Lupus diagnosis, the 26 participants who read the description of Lupus in which the disease filled the “attacker” role ($M = 4.81$, $SD = 1.132$), compared to the 25 participants who read the description in which the immune system filled the “attacker” role ($M = 5.08$, $SD = 1.08$), were (non-significantly) less

likely to indicate that they would be willing to take medications to replace vital substances the body can no longer make on its own, $t(49) = -0.879$, $p = 0.192$.

When faced with a hypothetical Lupus diagnosis, the 26 participants who read the description of Lupus in which the disease filled the "attacker" role ($M = 4.73$, $SD = 1.313$), compared to the 25 participants who read the description in which the immune system filled the "attacker" role ($M = 5.16$, $SD = 1.03$), were (non-significantly) less likely to indicate that they would be willing to take medications to relieve symptoms, $t(49) = -1.296$, $p = 0.100$.

The question asking how likely a participant would be to take a medication to suppress the immune system came the closest to rejecting the null hypothesis, and the results were in the predicted direction. The average response for those exposed to the condition in which the disease filled the "attacker" role was 3.65 (between "slightly unlikely" and "slightly likely") while the average response for those exposed to the condition in which the immune system filled the "attacker" role was 4.16 (between "slightly likely" and "moderately likely"). Therefore, although the results were not strong enough to be considered statistically significant, they at least indicate that it's probable that the choice of messaging has an impact on treatment intentions when it comes to this very commonly used type of medication.

As for the responses to the question asking how confident participants felt about fighting the disease and living a normal life, the difference between those exposed to the disease in the "attacker" role and the immune system in the "attacker" role were so similar (3.69 vs 3.68, respectively), that it doesn't seem like this difference in messaging has much of an impact when it comes to confidence and empowerment. It's possible that participants' preconceived notions of Lupus as a life-altering disease overrode any differences between these two conditions. It would be interesting to repeat the experiment with prompts describing autoimmune disease in general as opposed to Lupus specifically. It's also possible that the word "mistakenly," which was present in the condition in which the immune system fills the "attacker" role but not in the condition in which the disease fills the "attacker" role, could have influenced responses. Perhaps the

notion that the “attack” is happening “by mistake” made it seem like something that could be more easily remedied (the way a mistake can be corrected) and undercut the disempowering feelings that seem to usually come with the immune system in the “attacker” role.

GENERAL CONCLUSIONS & LIMITATIONS

From the results of the corpora analysis, AUTOIMMUNE DISEASE IS A BATTLE and AUTOIMMUNE DISEASE IS A JOURNEY are the two most prominent conceptual metaphors used by both patients and doctors when discussing autoimmune disease. There are differences between patients and doctors when it comes to filling in the roles of the source domains (BATTLES and JOURNEYS) with elements of the target domain (autoimmune disease). Notably, when the JOURNEY frame is evoked, patients tend to conceptualize themselves as the “travelers” while doctors conceptualize the disease as the “traveler.” This leads to opposite ideas of “progress” (as something that’s positive in the minds of patients and negative in the minds of doctors). The doctor’s understanding of “progress” even finds its way into the names of diseases, such as “Primary **Progressive** Multiple Sclerosis,” a version of the disease in which symptoms continue to get worse at a relatively steady rate. These opposing versions of progress need to be considered in healthcare communication. One could imagine a sentence on a healthcare website beginning with something like “You will reach a point…”, which, if drafted by doctors would most likely be indicating a point at which the disease has gotten worse, but for patients, may indicate an improvement in their disease if not further clarified.

When the BATTLE frame is evoked, patients tend to cast the disease itself in the role of the “attacker,” while doctors tend to cast the immune system in that role. In the few cases in which patients fill the “attacker” role with the immune system or the body (e.g. “*my immune system is **attacking** me*” or “*my body is **fighting** against itself*”) as opposed to the disease, they are typically expressing feelings of disempowerment. My hypothesis is that it’s easier to conceive of “winning a battle” against an abstracted disease than a part of your own body. It’s important that healthcare providers are aware

of the fact that when the immune system is the “attacker,” patients tend to feel less empowered, especially because this is overwhelmingly the way doctors communicate about autoimmune disease.

There also appear to be other constituent mappings in both of these conceptual metaphors that generally pattern with feelings of patient empowerment or disempowerment. For instance, in both the JOURNEY and BATTLE domains, having fellow “travelers” or “soldiers” seems to come up more often in language in which the patient is expressing feelings of empowerment. It can be helpful for healthcare providers to be aware of which metaphorical mappings tend to indicate feelings of disempowerment and nudge patients towards more empowering metaphors when they arise.

The corpus study is limited in that both corpora are relatively small and are not taken from very diverse sources (the patient corpora is taken exclusively from reddit for instance, which doubtlessly skewed the demographics). It’s also limited by the lack of multiple, independent sources conducting metaphor identification. I did all the metaphor identification myself, deciding what source domain was being used, and it’s entirely possible that others would come to different conclusions. Future research could expand the size and diversity of the corpora, have multiple metaphor identifiers, and perhaps use computational methods to identify metaphorical language so that metaphor identification doesn’t need to be done entirely by hand.

When it comes to the experimental component of the study, one major limitation was the small participant size. It’s difficult to reach statistical significance without large numbers of participants. Another limitation was the lack of multiple independent sources making decisions about which behaviors were classified as “self-bolstering” and “self-limiting.” I made these decisions on my own, and perhaps others would disagree. The fact that I only had two behaviors for each of these categories was another limitation. Perhaps participants were more or less likely to feel inclined to engage with these particular behaviors as opposed to other self-limiting or self-bolstering behaviors. It’s also possible that some of my “translations” of BATTLE metaphors to neutral language had unintended consequences. Perhaps certain word choices in this process were particularly empowering or disempowering for some reason.

Although none of the results were statistically signifiant, they indicate that explaining autoimmune disease with BATTLE metaphors (as is extremely common in healthcare communication) may make patients less likely to engage in self-bolstering behaviors and more likely to engage in self-limiting behaviors. The results also point to the fact that if you describe the immune system, rather than the disease, as the "attacker," patients may be more likely to take medication designed to suppress the immune system. Future research could conduct similar studies with a larger participant pool and find ways to test the impact of JOURNEY metaphors and other metaphorical framings of autoimmune disease.

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References

Bowker, J. (1996). Cancer, Individual Process, and Control: A Case Study in Metaphor Analysis. *Health Communication*, *8*(1), 91–104. doi: 10.1207/s15327027hc0801_5

Downing, L. H., & Mujic, B. K. (2009). INFECTIOUS DISEASES ARE SLEEPING MONSTERS: Conventional and culturally adapted new metaphors in a corpus of abstracts on immunology. IBÉRICA, 61-82.

Gentner, D. (1983). Flowing waters or teeming crowds: Mental models of electricity. In D. Gentner, & A. L. Stevens (Eds.), *Mental Models* (pp. 99-129). Hillsdale, New Jersey: Erlbaum.

Gibbs, R. W., & Franks, H. (2002). Embodied Metaphor In Womens Narratives About Their Experiences With Cancer. *Health Communication*, *14*(2), 139–165. doi: 10.1207/s15327027hc1402_1

Gwyn, R. (1999). “Captain of my own ship”: Metaphor and the discourse of chronic illness. *Researching and Applying Metaphor*, 203–220. doi: 10.1017/cbo9781139524704.013

Hauser, D. J., & Schwarz, N. (2015). The War on Prevention: Bellicose Cancer Metaphors Hurt (Some) Prevention Intentions. Personality and Social Psychology Bulletin, 41(1), 66–77.

Hodgkin, P. (1985). Medicine is war: and other medical metaphors. *Bmj*, *291*(6511), 1820–1821. doi: 10.1136/bmj.291.6511.1820

Lakoff, George. “Sorry, I'm not myself today : the metaphor system for conceptualizing the self “ Fauconnier, Gilles., and Eve. Sweetser. Spaces, Worlds, and Grammar. Chicago: U of Chicago, 1996. Print. Cognitive Theory of Language and Culture.

Lakoff, G., & Johnson, M. (1981). *Metaphors We Live by*. University of Chicago Press.

Mabeck, C. (1997). Metaphorically transmitted diseases. How do patients embody medical explanations? *Family Practice*, *14*(4), 271–278. doi: 10.1093/fampra/14.4.271

Pragglejaz Group. (2007). MIP: A Method for Identifying Metaphorically Used Words in Discourse. *Metaphor and Symbol*, *22*(1), 1–39. doi: 10.1207/s15327868ms2201_1

Reisfield, G. M., & Wilson, G. R. (2004). Use of Metaphor in the Discourse on Cancer. *Journal of Clinical Oncology*, *22*(19), 4024–4027. doi: 10.1200/jco.2004.03.136

Schubert, T. W. (2005). Your Highness: Vertical Positions as Perceptual Symbols of Power. *Journal of Personality and Social Psychology*, *89*(1), 1–21. doi: 10.1037/0022-3514.89.1.1

Semino, E., Demjén, Z., & Demmen, J. (2016). An Integrated Approach to Metaphor and Framing in Cognition, Discourse, and Practice, with an Application to Metaphors for Cancer. *Applied Linguistics*. doi:10.1093/applin/amw028

Semino, E., Demjén, Z., Demmen, J., Koller, V., Payne, S., Hardie, A., & Rayson, P. (2015). The online use of Violence and Journey metaphors by patients with cancer, as compared with health professionals: a mixed methods study. *BMJ Supportive & Palliative Care*, *7*(1), 60–66. doi: 10.1136/bmjspcare-2014-000785

Skott, C. (2002). Expressive Metaphors in Cancer Narratives. *Cancer Nursing*, *25*(3), 230–235. doi: 10.1097/00002820-200206000-00011

Sontag, S. (2002). *Illness as metaphor*. London: Penguin Books.

Thibodeau, P. H., & Boroditsky, L. (2011). Metaphors We Think With: The Role of Metaphor in Reasoning. *PLoS ONE*, *6*(2). doi: 10.1371/journal.pone.0016782

Timár, A. (2015). Derrida and the Immune System. Et Al. — Critical Theory Online (Terror(ism) and Aesthetics).

Williams, L. E., & Bargh, J. A. (2008). Experiencing Physical Warmth Promotes Interpersonal Warmth. *Science*, *322*(5901), 606–607. doi: 10.1126/science.1162548

Appendix 1

Introductory protocol

Data collected from this confidential survey will be used for completion of a master's degree in English at San Francisco State University. The information gathered will be used for research on healthcare communication.

The survey questions will be about autoimmune diseases.

You must be 18 years of age or older to participate. There are no risks or benefits to you in participating in this survey. You may choose to participate or not. You may answer only the questions you feel comfortable answering, and you may stop at any time. We hope you can fill out as many questions as you can. If you do not wish to participate, you may simply return the blank survey, with no penalty to yourself. If you do participate, **completion and return of the survey indicates your consent to the above conditions. Your decision of whether or not to participate in this research will have no influence on your present or future status at San Francisco State University.**

Please do not include your name anywhere on this survey. The survey should take approximately 2 minutes to complete. Any questions or concerns should be directed to the principal investigator, Skyler Ilenstine, at silenstine@mail.sfsu.edu
or the research advisor, Professor Smirnova, at smirnov@sfsu.edu.

- ◯ I am over the age of 18 and I agree to participate
- ◯ I decline to participate

Neutral_condition

Please read the following paragraphs. When you're finished, move on to the next page and answer the following questions.

Your body's immune system helps prevent disease and infection. But if you have an autoimmune disease, your immune system can negatively affect healthy cells in your body. Autoimmune diseases can affect many parts of the body.

The blood cells in the body's immune system help keep the body healthy when coming into contact with certain substances. Examples include bacteria, viruses, toxins, cancer cells, and blood and tissue from outside the body. These substances contain antigens. The immune system produces antibodies against these antigens that enable it to keep you healthy.

When you have an autoimmune disorder, your immune system does not distinguish between healthy tissue and antigens. As a result, the body sets off a reaction that negatively affects normal tissues.

The behaviors on the following pages have been found to be helpful in alleviating the symptoms of some autoimmune diseases. Please indicate how likely you would be to engage in each behavior if you were diagnosed with an autoimmune disease.

Limiting sun exposure

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Limiting consumption of caffeine, alcohol and sugar

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Being physically active for 30 minutes a day

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Eating more fruits, vegetables, and/or lean meats

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Battle_condition

Please read the following paragraphs. When you're finished, move on to the next page and answer the following questions.

Your body's immune system protects you from disease and infection. But if you have an autoimmune disease, your immune system attacks healthy cells in your body by mistake. Autoimmune diseases can affect many parts of the body.

The blood cells in the body's immune system help protect against harmful substances. Examples include bacteria, viruses, toxins, cancer cells, and blood and tissue from outside the body. These substances contain antigens. The immune system produces antibodies against these antigens that enable it to destroy these harmful substances.

When you have an autoimmune disorder, your immune system does not distinguish between healthy tissue and antigens. As a result, the body sets off a reaction that destroys normal tissues.

The behaviors on the following pages have been found to be helpful in alleviating the symptoms of some autoimmune diseases. Please indicate how likely you would be to engage in each behavior if you were diagnosed with an autoimmune disease.

Limiting sun exposure

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Limiting consumption of caffeine, alcohol and sugar

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Being physically active for 30 minutes a day

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely

- Moderately unlikely
- Extremely unlikely

Eating more fruits, vegetables, and/or lean meats

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

attacker role: disease

Please read the following scenario. When you're finished, please move on to the next page and answer the questions.

Imagine you have been diagnosed with Lupus (an autoimmune disease that can attack your joints, skin, kidneys, blood cells, brain, heart, or lungs).

How much do you agree with the following statement: "I'm confident that I can fight this disease and have a good quality of life."

- Strongly agree
- Agree
- Somewhat agree
- Somewhat disagree
- Disagree
- Strongly disagree

The types of medication on the following pages have been found to be useful in managing Lupus. How likely are you to take each type if it was suggested by your doctor?

Medications to relieve symptoms

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely

- Moderately unlikely
- Extremely unlikely

Medications to replace vital substances the body can no longer make on its own

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Medications to suppress the immune system

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Attacker role immune system

Please read the following scenario. When you're finished, please move on to the next page and answer the questions.

Imagine you have been diagnosed with Lupus (an autoimmune disease in which your immune system can mistakenly attack your joints, skin, kidneys, blood cells, brain, heart, or lungs).

How much do you agree with the following statement: "I'm confident that I can fight this disease and have a good quality of life."

- Strongly agree
- Agree
- Somewhat agree
- Somewhat disagree
- Disagree
- Strongly disagree

The types of medication on the following pages have been found to be useful in managing Lupus. How likely are you to take each type if it was suggested by your doctor?

Medications to relieve symptoms

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Medications to replace vital substances the body can no longer make on its own

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

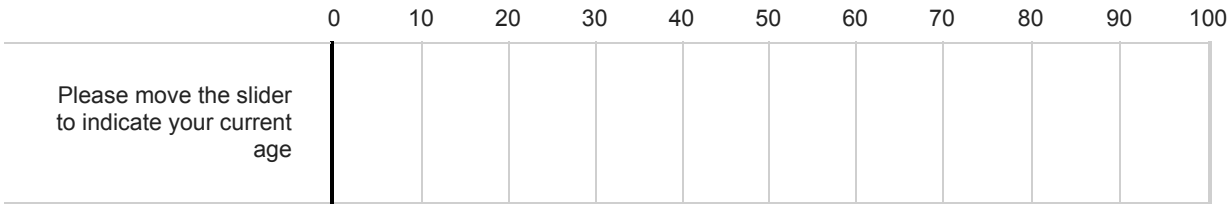
Medications to suppress the immune system

- Extremely likely
- Moderately likely
- Slightly likely
- Slightly unlikely
- Moderately unlikely
- Extremely unlikely

Demographic questions

How old are you?

0 10 20 30 40 50 60 70 80 90 100



What is your gender?

- Male
- Female
- Other

Have you ever been diagnosed with an autoimmune disease?

- Yes
- No
- I'm not sure

What is your native language?

- English
- Other (please specify)

Random ID

Here is your ID: ${e://Field/Random%20ID}

Copy this value to paste in MTurk.

When you have copied this ID, please click the next button to submit your survey.